HUDBAY

February 2, 2018

Mr. William James
National Mining Expert
Great Lakes and Ohio River Division
U.S. Army Corps of Engineers
3701 Bell Road
Nashville, Tennessee 37214-2660

Ms. Deanna Cummings
Senior Regulatory Project Manager
Albuquerque District
U.S. Army Corps of Engineers
4101 Jefferson Plaza NE
Albuquerque, NM 87109

Re: Response to EPA Comments – Significant and irreversible Environmental Consequences of Groundwater Drawdown from the Proposed Rosemont Copper Mine, October 5, 2017 (Revised November 30, 2017)
Rosemont Copper Project, Clean Water Act Section 404 Permit, CoE File No.: 2008-00816-MB

Dear Mr. James and Ms. Cummings:

On December 1, 2017, the U.S. Army Corps of Engineers (Corps) transmitted a copy of EPA comments regarding the Significant and irreversible Environmental Consequences of Groundwater Drawdown from the Proposed Rosemont Copper Mine dated November 30, 2017 to Rosemont Copper (Rosemont). Since that time, Rosemont and its technical consultants, Neirbo Hydrogeology, Fennemore Craig and WestLand Resources, have been reviewing the document.

Rosemont is specifically concerned about two persistent themes threaded th roughout the discussion. The first is that drawdown is a regulated "secondary impact" that must be considered by the Corps and the second is that the evaluation of impacts performed for the FEIS prove that there will be significant environmental impacts associated with this drawdown. Both of these statements are incorrect and the attached document addresses the concerns more fully.

While evaluating the response document, in terms of the discussion regarding the modeled impacts of drawdown, Rosemont would like to make sure that the Corps considers the information provided to the Forest Service and the Fish and Wildlife Service in a letter dated March 16, 2010. This letter details our concerns regarding the limitations and use of groundwater flow models as sociated with the Supplemental Information Report and the Biological Opinion referenced by the EPA.

Rosemont has also prepared and submitted substantive comments (February 1, 2018) on the significant degradation evaluation prepared by EPA and has previously replied to the EPA comments on the HMMP (January 25, 2018). Rosemont believes that EPA's evaluation of significant degradation missed the mark when they deviated from the evaluation of the fill activity in favor of a discussion of drawdown from a pit and from pumping activities.

Rosemont Copper Company
5255 East Williams Circle
Suite 1065
Tucson, Arizona 85711
(520) 495-3500
hudbayminerals.com

We also firmly believe that throughout the documents presented EPA mischaracterizes the Cienga Creek basin, the Barrel Canyon drainage, and Davidson Canyon. We hope that the information provided clarifies our concerns.

If you have questions or require further information regarding this topic, I can be reached at (520) 495 - 3502 or via email at kathy.arnold@hudbayminerals.com.

Regards,

Katherine Ann Arnold

Katherine Ann Arnold, PE
Director, Environment

Attach: *Response to EPA (2017), "Significant and Irreversible Environmental Consequences of Groundwater Drawdown from the Proposed Rosemont Mine."*, February 2018

cc: File

Doc. No. 009/18-15.2.1

RESPONSE TO ENVIRONMENTAL PROTECTION AGENCY (2017)

"Significant and Irreversible Environmental Consequences of Groundwater Drawdown from the Proposed Rosemont Mine"

Prepared for:

Rosemont Copper Company
5255 East Williams Circle, Suite W1065 • Tucson, Arizona 85711

Project Number: 1049.117
February 2018

Prepared by:

FENNEMORE CRAIG

NEIRBO HYDROGEOLOGY

WestLand Resources

TABLE OF CONTENTS

1. INTRODUCTION

In a letter dated November 30, 2017, the Environmental Protection Agency (EPA) transmitted three separate memoranda to the U.S. Army Corps of Engineers (Corps) providing comments on the Rosemont Copper Project (the Project). In this report, we address comments contained in the memorandum titled "EPA Analysis of the *Significant and Irreversible Environmental Consequences of Groundwater Drawdown from the Proposed Rosemont Mine* (dated October 5, 2017, revised November 30, 2017) (EPA 2017).

In the memorandum, the EPA (2017) asserts that, "*the secondary effects of groundwater drawdown from the proposed Rosemont Mine, which causes or contributes to a significant degradation of waters.*" Threaded through the comments are two persistent themes that are not supported by the Final Environmental Impact Statement (FEIS) for the Rosemont Copper Project (2013), the Supplemental Information Report (SIR) (2015), the Clean Water Act (CWA) or the 404(b)(1) Guidelines. The first is that drawdown is a regulated "secondary impact" that must be considered by the Corps and the second is that the evaluation of impacts performed for the FEIS prove that there will be significant environmental impacts associated with this drawdown.

Both of these statements are incorrect. As to the severity of the impacts, the statements made by EPA are not supported by any independent analysis on the part of EPA, the FEIS/SIR analysis, the characterization of the model accuracy, or the determinations made during the FEIS process. It is unlikely that there will be significant impacts to aquatic resources, and the impacts that are predicted to occur are distant in time, quite small if they occur at all, and well within the range of natural variation. In addition, the CWA and 404(b)(1) Guidelines are clear that these types of effects are not subject to the Corps' regulatory authority.

Although the comments provided by the EPA (2017) tend to be repetitive and similarly themed, we have attempted to structure the responses in this report to mirror to the extent practicable the presentation by the EPA (2017). We also note that EPA draws extensively from the conclusions of the U.S. Fish & Wildlife Service (FWS) in its Amended Final Reinitiated Biological and Conference Opinion for the Rosemont Copper Mine, Pima County, Arizona dated April 28, 2016 (BO; FWS 2016). Rosemont provided extensive comments on the BO throughout its development and revision and incorporates those comments here by reference.

2. PROJECT DESCRIPTION AND ENVIRONMENTAL SETTING

The EPA (2017) asserts that the Cienega Creek watershed is a "*near pristine landscape rich in biodiversity*." This is not an accurate portrayal of the Cienega Creek watershed. The watershed does include the Las Cienegas National Conservation Area[1] and the Cienega Creek Nature Preserve[2], which currently have special protections and together total 49,010 acres or 76.6 square miles out of the total 457 square miles in the watershed or about 16.8 percent of the total watershed area. Characterizing these areas as pristine is questionable given historic grazing practices and human uses. In any event, EPA does not mention the other uses within the watershed including agriculture, wineries, historic mining activities including lead and copper mining, a historic smelter, two historic townsites, railroad operations including railroad bedding materials, quarries, housing developments using septic systems for wastewater disposal, and ranching. While sections of the watershed are currently preserved, the entire watershed is not pristine and has been historically altered from a natural condition.

Further characterizations include a misrepresentation of flow regimes for the various tributaries of Cienega Creek. Specifically, Barrel Canyon is ephemeral—not intermittent or perennial—and Davidson Canyon is ephemeral with two intermittent stretches more than twelve miles from the Project site. There are no perennial reaches in Davidson Canyon. All other drainages discussed are in a separate sub-watershed and are not impacted by the fill activities at all. There are no wetlands (special aquatic sites) on the Project site and the ephemeral system transmits stormwater. Specifics regarding the site and impacts are discussed further in the Significant Degradation portion of the EPA transmittal in table format.

The proper interpretation of predictions of groundwater drawdown by regional models developed to understand effects of the Project is that drawdown across the Cienega Creek Basin, as a result of the Project, is predicted to be small and would not occur until far into the future. The approaches taken by the FEIS, SIR, and BO, while disclosing the worst-case scenario, provide a greatly overestimated conclusion of the impacts of the Project on aquatic resources. In some cases, the conclusions are impossible given the data provided. Simply stated, these regional groundwater models do not predict significant effects to aquatic resources. This section outlines the flaws of the FEIS, SIR, and BO that lead to their mischaracterization of potential effect of the Project on aquatic resources.

The FEIS uses a simplistic analysis to disclose the worst-case scenario of groundwater drawdown. Specifically, the FEIS used historical data from the USGS stream gage along Upper Cienega Creek to predict reductions in stream flow depth. The FEIS assumes, inappropriately, that a predicted foot of drawdown in the aquifer will result in a concomitant 1-foot reduction in stream flow along Cienega

[1] https://www.blm.gov/node/10128

[2] https://webcms.pima.gov/UserFiles/Servers/Server_6/File/Government/Natural%20Resources%20Parks%20and%20Recreation/Parks/Cienega%20Creek%20Natural%20Preserve/Cienega_Brochure.pdf

Creek. As has been discussed in some detail, the use of predictions of regional groundwater models for predicting small stream flow changes hundreds of years into the future is a severe misuse of this scientific data. Not withstanding this fundamental flaw in the FEIS analysis, this simplified analysis severely overestimates the potential effects on the groundwater system.

The FEIS:

1. Does not fully incorporate into its analysis the physical processes that govern the interaction between surface water and groundwater;
2. Inappropriately assumes that when the water level is at, or below, the bottom of the v-notch weir at USGS Gage#09484550 on Upper Cienega Creek (i.e. there is no recorded flow), the drainage is dry;
3. Inappropriately assumes that surface water dynamics at the USGS gage are exactly the same as the surface water dynamics along all other reaches in the analysis;
4. Overestimates the impact of drawdown on Upper Cienega Creek by inappropriately assuming that reductions in stream flow in the tributaries of Upper Cienega Creek would result in additional drawdown in Upper Cienega Creek that is not accounted for in regional groundwater models;
5. Inappropriately assumes that groundwater drawdown results in an equivalent reduction in the depth of surface water; and
6. Inappropriately uses sensitivity analyses performed by Tetra Tech (2010) and Montgomery & Associates (2010) to analyze groundwater effects.

The resulting analysis, while disclosing the worst-case scenario of drawdown in the Cienega Creek Basin, does not represent an appropriate scientific analysis of potential effects of drawdown on aquatic resources and greatly overstates potential effects of the Project. This analysis cannot be relied upon to conclude that the Project will have significant adverse effects on aquatic resources in the Cienega Creek Basin.

Following reinitiation of Section 7 consultation for the Project, the U.S. Forest Service (USFS) collected additional data of stream flow and pool depth along Cienega Creek and its tributaries and provided a reanalysis of potential effects of the Project on aquatic resources in the SIR. The additional analyses provided by the SIR suffer from the same fundamental flaw of the inappropriate use and misinterpretation of predictions of regional groundwater models to calculate slight changes in stream flow, and in the case of the SIR, the depth of individual pools, hundreds of years into the future.

Even if one were to overlook the fundamental misuse of regional groundwater models, the analyses provided by the SIR also use flawed methods, similar to the FEIS, that result in the overstatement of effects. The SIR and the EPA comments acknowledge that the FEIS analysis that assumed a one-to-one relationship between drawdown and stream stage was seriously flawed. The refined SIR analysis that was intended to correct the one-to-one analysis was also flawed and overestimated potential impacts. A simplistic linear relationship was assumed between alluvial groundwater levels and streamflow in Empire Gulch Spring and Cienega Creek. This approach ignores the dynamic interactions between precipitation, stormwater runoff, recharge, evapotranspiration, temperature, bedrock groundwater, alluvial groundwater, and natural trends that influence streamflow. The simple linear relationship is insufficient to accurately predict streamflow responses due to drawdown that are subsequently translated into highly specific impacts. Examples of SIR impacts that exceed science's predictive capability include streamflow loss (to 0.1 gallons per minute); number of days with zero flow (per year); number of days with extremely low flow (per year); number of isolated pools for each 0.2 feet of drawdown; median pool depth (to 0.1 feet); median pool volume (to 0.1 cubic feet); and median pool surface area (to 0.1 square feet).

These SIR methods include the use of a 95th percentile analysis of sensitivity models that was effectively a 97.5th percentile since it relied solely on the highest predicted impacts to aquatic resources. The methodological approach of the SIR introduced an additional flaw that further overestimated potential effects of drawdown on aquatic resources in the Cienega Creek Basin. The SIR calculated the 97.5th percentile of sensitivity models that predicted the highest effects to stream flow by reach of Cienega Creek and its tributaries. The consequence of this approach was that the model set used to inform impacts to aquatic resources included only extreme values of hydrologic parameters and resulted in <u>mutually exclusive models</u> being combined additively by reach to arrive at predicted effects to aquatic resources along Cienega Creek. As such, the results provided by the SIR not only overestimate potential effects of the Project similar to the FEIS, but further report effects that are not possible given the hydrologic data available.

The BO for the Project relies heavily on the analyses provided by the SIR, consequently it exaggerates the effects to listed aquatic species and their habitat. The BO further overestimates the effects of the Project by mischaracterizing the effects of the Project in the context of climate change. To analyze potential effects to aquatic resources, the BO contemplates two scenarios: 1) the combination of climate change and the Project, and 2) the Project without climate change. However, the analysis does not include the acknowledgment or discussion of effects of climate change on listed species and their habitat without the development of the Project. Such an analysis would have disclosed to the public the fact that climate change is predicted to effect listed species within the Cienega Creek Basin far greater than the Project, and in some cases, the effect of climate change on aquatic resources would occur considerably sooner than predicted impacts from the Project. In these circumstances, climate change would result in the drying of certain reaches within the Cienega Creek Basin long before groundwater drawdown from the Project is predicted to impact these same reaches.

3. SPECIFIC EPA COMMENT RESPONSE

The EPA (2017) comments are shown in *italics*; and our responses are provided immediately following.

1. **Comment** (Page 1, Paragraph 4 and Page 2, Paragraph 1): *The upstream tributaries of Cienega Creek, including Davidson and Barrel Canyons, Empire Gulch and its headwaters, provide a wide range of functions critical to aquatic ecosystem health and stability…The ephemeral and intermittent streams are responsible for a large portion of basin groundwater recharge in this semi-arid region through channel infiltration. (Reference: Levick, L., J. Fonseca, D. Goodrich, M. Hernandez, D. Semmens, J. Stromberg, R. Leidy, M. Scianni, D.P. Guertin, M. Tluczek, and W. Kepner. 2008. The Ecological and Hydrological Significance of Ephemeral and Intermittent Streams in the Arid and Semi-arid American Southwest. U.S. EPA and USDA/ARS Southwest Watershed Research Center, EPA/600/R-08/134, ARS/233046, 116 pp. [Levick 2008].)*

   Response: The magnitude and significance of channel infiltration in upstream tributaries to Cienega Creek, including Davidson Canyon, and hence its contribution to basin groundwater recharge, is unknown. EPA's general assertion that ephemeral and intermittent streams are "*responsible for a large portion of basin groundwater recharge*" is not supported by the referenced source. The referenced source (Levick et al. 2008) states that there are many factors that determine the magnitude of recharge through channel infiltration, that these factors are difficult to know, and that recharge, in general, is largely a function of precipitation that is highly variable in location, magnitude, duration, and frequency. In fact, the lack of perennial surface flows and springs and the limited hydroriparian vegetation, indicate that streambed recharge is very limited in Davidson Canyon. Cienega Creek has similar conditions; however, its larger area and more developed channel alluvium may result in an overall larger volume of channel recharge. The small perennial stream flow measured at the USGS gage in Cienega Creek (USGS Gage 09484550), limited pools, and limited flowing reaches indicate that there is limited channel recharge.

   The cited reference, (Levick et al. 2008), acknowledges the inherent complexity and uncertainty:

   - Page 20, Paragraph 2; The magnitudes and rates of transmission losses for stream flow or flood events in a given arid and semi-arid region river are often highly variable, as both depend on a complex of interrelated factors, including the characteristics of the storm (e.g., size, position of the storm track, location in relation to the drainage network), the hydrograph (e.g., flow volume and duration), and the channel (e.g., width of the wetted perimeter, porosity and initial moisture content of the channel bed, stratigraphy of the channel fill).
   - Page 22, Paragraph 3; However, an accurate representation of ground-water recharge is difficult since it cannot be measured directly on a basin scale, in addition to other reasons, including the extremely small recharge rates and recharge mechanisms that vary greatly in time and space throughout a watershed.

2. **Comment** (Page 2, Paragraph 2): *Annual water use of 5,400 acre-feet during the first eight years of mining represents an increase of 6.7 percent in area pumping. (Reference: SIR, p. 24)*

   Response: This statement is from the SIR, but is misleading. This increase in area pumping refers to the west-side water-supply wells located in the Upper Santa Cruz Subbasin, and not to the mine itself, which is located in Davidson Canyon drainage, immediately adjacent to the Cienega Creek Basin on the eastern flank of the Santa Rita Mountains, and for the purposes of the FEIS, considered part of the Cienega Creek Basin. Groundwater pumping in the Upper Santa Cruz Subbasin does not contribute to the drawdown EPA is concerned with in this paper.

3. **Comment** (Page 3, Paragraph 2): *Per the USFS, the groundwater modeling used in the FEIS and SIR cannot predict the magnitude or timing of the mine's impacts on distant waters such as Cienega Creek, Davidson Canyon, and Gardner Canyon. The threshold of accuracy for the available models (about 5 feet) renders the analysis of groundwater drawdown on distant surface waters highly uncertain. Therefore, the FEIS and SIR analyses present a range of modeling scenarios as possible outcomes. The USFS chose a single "best-fit" modeling scenario as the best calibrated to real-world conditions and the most likely outcome from the models. This does not change the overall uncertainty of the models and their inability to detect significant impacts that occur from relatively small amounts (i.e., <5 feet) of groundwater drawdown.*

   Response: This comment illustrates a basic misunderstanding of natural process and predictive modeling. Groundwater modeling does predict the magnitude and timing of the mine's impacts on distant waters; however, these impacts are small in magnitude and take over a hundred years for the drawdown to reach 0.01 feet. The natural and engineered environments are much too complex and variable to model explicitly; therefore, simplifications are required which reduces the predictive accuracy. The currently attainable predictive accuracy, however, is sufficient for making sound management decisions.

   The 5-foot threshold was initially set as the point at which impacts would be considered a magnitude that allowed for an appropriate and reasonable analysis and the point at which model accuracy was not exceeded. Areas with less than 5 feet of drawdown would thus be considered unaffected. Project opponents (including EPA) interpreted this to mean that there could be much more than the predicted small drawdowns or that substantial changes from current conditions would result.

   The FEIS specifically acknowledges the uncertainty on pages 689-690 by stating, "*A range of outcomes was assessed for Cienega Creek, all of which have high levels of uncertainty due to the long timeframes, long distances, and small amounts of drawdown involved. The most likely scenario suggests that noticeable reductions in stream flow in Cienega Creek would not occur for hundreds of years after closure and, once occurring, would not result in widespread absence of flow along Cienega Creek.*"

Less than 5 feet of drawdown, and certainly the approximately 0.1 foot predicted in key reaches of Cienega Creek, is insignificant in the context of natural variability that has been routinely observed in the basin and will continue to be observed in the future. Natural variability in the analysis area including Cienega Creek is discussed in the FEIS on pages 294-295 with variations ranging from 3 to 10 feet annually and long-term fluctuations of 19.7 feet. It is outside of the model ability to predict effects at such a low level (less than 1 foot) and over such long, time periods.

The EPA statement *"…models and their inability to detect significant impacts that occur from relatively small amounts (i.e., <5 feet) of groundwater drawdown"* illustrates the basic misunderstanding of numerical models. Models neither *detect* nor *measure*; models calculate a numerical quantity based on inputs and equations that are all approximations of the real world. There is no evidence or scientifically valid analysis that "significant impacts" (greater than routinely experienced in the environment) will occur from the expected small drawdown. Significance is a statistical interpretation or a subjective term and clearly has different meanings depending on use or one's perspective, however, "significant impacts" do not occur from changes that are within the range of natural variation. If that were the case then these significant impacts would have already been realized. Groundwater-level changes or drawdown when the depth-to-water increases, or changes in stream flow are not "significant impacts" when they occur within the range of natural variability, as is predicted.

The "best-fit" modeling scenario and the most likely outcome was **not** used in the FEIS or SIR to analyze effects of groundwater drawdown. Instead, the most extreme and unlikely to occur scenarios represented by sensitivity analyses were used to predict impacts. In the SIR, these selected worse case scenarios were specific to each individual location of interest. Rosemont shares two examples of these scenarios to illustrate:

1) At location A, a permeability increase could result in the maximum drawdown, whereas, at location B, an aquifer storage decrease could result in the maximum drawdown and these changes could be predicted to occur hundreds of years apart. The maximum change was selected for each location regardless of whether the combination of simulated conditions at all locations were physically possible.
2) Two separate models, each with unique geologic interpretations of an underground dike which is a barrier to groundwater flow, were assumed to both predict groundwater drawdown even though only one could be correct. This resulted in different drawdown predictions in different portions of the basin. The worst case was assumed to happen to give the most "conservative analysis" even though physically both could not occur.

This approach resulted in the use of mutually exclusive groundwater models across reaches, thereby assuming hydrologic conditions that are impossible to occur simultaneously. Consequently, the analysis provided by the SIR uses extreme model scenarios far from the "best-fit" of available data and conditions that are impossible to occur as the basis for analysis of potential impacts.

Moreover, even though the FEIS and SIR recognized the model limitations, impacts were evaluated at predicted drawdown less than 0.1 foot. For the SIR analysis, the USFS requested model results at specific key reaches and used predictions with precision of 0.001 to 0.0001 feet (SIR p. 81). This basic misuse of the groundwater model precision was detailed in Rosemont's comments to the FWS on the BO, but needs to be recognized to put the EPA comments into perspective.

4. **Comment** (Page 3, Paragraph 3): *Small changes in groundwater levels will have profound adverse effects on surface, and shallow subsurface (i.e., groundwater and hyporheic) flows.*

   Response: This statement is subjective speculation and is not supported by scientifically valid analysis within the Cienega Creek Basin. As stated above, the current natural fluctuations of groundwater are larger than the calculated changes, which calls this assessment into question.

5. **Comment** (Page 3, Paragraph 3): *Typically, there is a nonlinear relationship between groundwater-stream interactions such that changes in groundwater levels and stream flow are rarely a simple 1:1 relationship. (Reference: Earman and Dettinger, 2011) A consequence is that relatively small drawdown of groundwater levels can result in significant declines in groundwater contributions to stream base flows; one such study by Knox (2006) demonstrated that decreases in groundwater storage of about 3-5% resulted in a decline of stream base flow of 31% and total stream flow of 35%. (Reference: 'as presented in Earman and Dettinger, 2011). Potential impacts of climate change on groundwater resources – a global review. Journal of Water and Climate Change 24: 213-229.)*

   Response: EPA is correct that a simple one-to-one relationship, as used in the FEIS, between groundwater levels and stream stage does not fully reflect the complex relationship between the two. However, the SIR refined analysis uses a simplistic linear relationship between alluvial groundwater level and streamflow that does not provide predictive accuracy that would substantiate the SIR impact predictions. Furthermore, the EPA makes a global conclusion that "*relatively small drawdown of groundwater levels can result in significant declines in groundwater contributions.*" It is true that this can occur, however, the opposite also occurs—large drawdown can result in insignificant declines in groundwater contributions. The EPA statement fails to consider the complex dynamics and physical properties that govern groundwater contributions to stream flow.

   The sources cited for EPA's assertion that small reductions in groundwater levels can result in significant declines in groundwater contributions to baseflow do not support EPA's conclusion as applied to Davidson Wash or Cienega Creek. The studies EPA cites were from large aquifer systems with vast groundwater storage and large aquifer thickness. A small percentage decrease in a large aquifer's thickness can be a significant volume. However, these conditions do not apply to the Cienega Creek Basin, so these studies are not relevant. Comparing percentage changes in storage from the Republican River Basin in Colorado, Nebraska, and Kansas to stream baseflow declines in another basin in another state (it could be the San Pedro Basin, but this is unclear) is inappropriate and misleading.

Furthermore, EPA fails to reference Alley (2007), which is partially responsible for the cited study results in Earman and Dettinger (2011). Knox (2006) is an oral presentation that does not mention any of the cited results. None of these references—Earman and Dettinger (2011), Alley (2007), and Knox (2006)—contain or support the statement *"…declines in stream baseflow of approximately 31% and declines in total stream flow of approximately 35%.*" It is unclear what these data refer to or how this statement is applicable to Cienega Creek Basin.

Alley (2007) sources unpublished written communication from several studies and states "Well-known areas in which the effects of ground water pumping on surface water resources have become important issues with limited overall ground water storage depletion include the Edwards aquifer in Texas (where a few feet of water-level change can affect spring discharge required for endangered species habitat), the Upper San Pedro Basin in Arizona (depletion of about 1% to 2% of the 20 to 26 million acre-feet of total ground water storage in the Sierra Vista subwatershed; "…*and the Upper Republican River Basin in Colorado, Kansas, and Nebraska (depletion of about 3% to 5% of the 350 million acre-feet in storage…*" It is inappropriate to apply these results from very different groundwater systems to the Cienega Creek Basin.

6. **Comment** (Page 4, Paragraph 1): *Significant changes to stream base flow are possible because typically inflow to streams originates from the uppermost portions of the subsidizing aquifer; small declines in the water table can significantly reduce groundwater contributions that sustain stream flow. (Reference: Earman and Dettinger, 2011.)*

   Response: EPA's comment is imprecise and does not support the conclusion that significant impacts from groundwater drawdown would occur in this instance. To start with, the reference EPA relies on acknowledges: "…forecasting future groundwater conditions would still be difficult because of the complex combinations of processes that affect groundwater recharge, discharge and quality." In addition, there are no such things as typical conditions. Each site is unique and conditions in one area cannot be assumed to apply in another area. There is no evidence to support that the EPA statement is relevant to Cienega Creek Basin, it is conjecture.

   Finally, EPA's observation that *"typically inflow to streams originates from the uppermost portions of the subsidizing aquifer"* is either poorly worded or indicates a lack of understanding of groundwater and surface-water interactions. Clearly, groundwater flows into a stream channel at the interface between the aquifer and channel, which is the uppermost part of the aquifer. This physical condition has no relationship to the origin of the groundwater, which can be recent direct precipitation, infiltrating stormwater runoff, shallow alluvial groundwater, bedrock groundwater, or a combination of all sources.

The amount of water-table decline that would "*significantly reduce groundwater contributions*" depends on: 1) whether the stream is gaining or losing water to the groundwater system; 2) the streambed conductance; 3) the hydraulic gradient between the stream and the aquifer; and 4) the change in the aquifer's hydraulic gradient toward the stream due to drawdown. EPA (2017) oversimplifies the physical processes that influence groundwater contributions to stream flow and uses subjective language that is meaningless in a scientific context.

7. **Comment** (Page 4, Paragraph 2): *All USFS models predict eventual groundwater drawdown in the assessment area. If we accept the output of the modeling and sensitivity analyses, the probability of occurrence of some level of more than trivial ground- and surface-water drawdown at sensitive waters remains very high.*

   Response: This comment misinterprets the modeling results, which show that the probability of "*more than trivial*" drawdown is exceedingly low and that the mine is unlikely to create a noticeable impact on sensitive waters. The key word in the EPA statement is "*eventual.*" Model predictions in some sensitive areas do indicate a change, but these changes (which are trivial in the context of natural variability) occur hundreds of years into the future. For example, the natural variability in precipitation, with or without climate change, is extremely large. Historically wetter and dryer conditions than are presently being experienced have occurred. These natural changes will dwarf and offset any predicted impacts from the mine simply due to the large distances and the natural attenuation effects. Moreover, as analyzed in detail by Rosemont and its consultants, the analysis of groundwater models by the USFS incorporates substantial levels of precaution; thereby introducing severe bias towards a conclusion that drawdown is likely to occur in sensitive areas. In particular, the USFS inappropriately:

   1) Considers predicted results of sensitivity analyses of groundwater models as reasonably certain to occur,
   2) Uses the 97.5th percentile of these available sensitivity runs to analyze effects to sensitive areas,
   3) Uses mutually exclusive groundwater models across reaches to calculate the effects of the Project, thereby assuming hydrologic conditions that are impossible to occur given the data provided.

8. **Comment** (Page 4, Paragraph 2): …*these aquatic habitats are regionally rare, small in area and fragmented, and are currently shrinking in response to the ongoing drought. Projected climate change will also result in further significant groundwater drawdown and the drying of surface waters in the assessment area*

   Response: The available data indicate that this statement is true. Cienega Creek Basin waters are likely to experience periods with no surface expression in the near future (10-20 years) due to current climate conditions. A small, mine induced effect hundreds of years into the future will be irrelevant following the previously experienced completely dry conditions.

9. **Comment** (Page 4, Paragraph 3): *Groundwater drawdown from the Rosemont Mine will cause unacceptable adverse impacts to surface waters, including wetlands of the Cienega Creek watershed. Groundwater drawdown from the mine pit will place stress directly on the regional aquifer. The SIR analysis assumes for many key reaches that there is a complete hydraulic connection between the regional aquifer, the shallow alluvial aquifer, and surface flow in the stream channel. The USFS expects that the stress placed on the regional aquifer by the mine pit will result in drawdown, which will, in turn, result in drawdown in the shallow alluvial aquifer, and reduced stream flows. (Reference: SIR, p. 76.)*

   Response: This is an overstatement of the likelihood of adverse effects occurring due to groundwater drawdown associated with the mine pit. Both the FEIS and SIR describe the limitations of the modeling and the predictive capabilities of those models. The FEIS states, for example, in the discussion on impacts to perennial stream flow: "It is important to understand that the detailed predictions contained in this section are meant to inform the decision and to show what could potentially happen if the model predictions were to occur as modeled; however, this does not change the overall uncertainty." (FEIS at p. 501)

   The FEIS and SIR analyses add assumptions and simplifications on those that were already made to produce the groundwater models. This was necessary in order to make the impact calculations straightforward but not because those assumptions were necessarily reasonable or likely. For instance, the SIR makes the "complete hydraulic connection" assumption out of convenience to arrive at a numerical result and, therefore, a potential impact. The SIR analysis and the description found in the *Draft Memorandum: Refined Approach to Streamflow Predictions* (SWCA 2014) illustrate the limitations of this approach. Many of the analysis assumptions are listed in the report; however, merely acknowledging the assumptions does not make them acceptable for use in quantifying Project impacts. In addition, the SIR assumes that all effects are additive, which leads to overly conservative impact assessments.

   When you combine the use of sensitivity analysis to describe a range of impacts, the use of results that that translate to a 97.5th percentile, the use of simplified assumptions such as complete hydraulic connection between areas, and perform a reach-by-reach analysis to develop additive impacts, the result is an extremely conservative analysis that significantly misrepresents impacts. We believe that if the FWS and the USFS correctly accounted for the analysis, it would be impossible to conclude that there is any likelihood of unacceptable or adverse impact.

10. **Comment** (Page 4, Paragraph 4): *Per the FEIS, because of the proposed mine, streams would change from intermittent/perennial flow status to ephemeral flow status as follows: Empire Gulch: 3 miles impacted, Cienega Creek: 20 miles, Gardner Canyon: 1mile. Also, Sycamore Canyon north and south, Box Canyon, and Mulberry canyon would be subject to drying effects. (Reference: FEIS, Table 108.)*

    Response: This is another example of the certainty EPA ascribes to drawdown in the regional groundwater table to impacts on these aquatic resources. These impacts are a possibility, but are considered unlikely to occur. They are modeled and disclosed in the FEIS to show a range of possible outcomes. In addition, EPA is mischaracterizing how certain reaches are discussed in the FEIS. FEIS, Table 108 states: "Some intermittent streams associated with springs in Sycamore Canyon (north), Sycamore Canyon (south), Box Canyon, and Mulberry Canyon **may be** impacted [emphasis added]." The EPA is overstating the certainty and severity of potential impacts.

11. **Comment** (Page 5, Paragraph 1): *"…major shifts in riparian vegetation in reaches of Empire Gulch would be expected to be well underway, with complete loss of the hydroriparian corridor and transition to xeroriparian vegetation regardless of climate change stresses. This change in riparian vegetation density and health would be likely to trigger negative feedback loops, resulting in head cuts, erosion, and downstream sedimentation." (Reference: SIR, p. 131.)*

    Response: The SIR does not predict a "*complete loss of the hydroriparian corridor.*" SIR Table 49 (p. 127) states: "Quantitative research on effects of stream flow permanence are mixed, are grouped in wide categories, and are difficult to use predictively. Overall, research indicates the shift to a less permanent stream flow system is associated with reduced basal area, size classes, stem density, and vegetation height for cottonwood/willow, and increased basal area and stem density for tamarisk." Vegetation characteristics would change if there were declining water levels, but this would not indicate a "*complete loss of the hydroriparian corridor*".

    The SIR does not explicitly consider changes in riparian vegetation in its impact analysis; it is considered qualitatively by presenting generalized, non-site specific, and potential vegetation changes due to groundwater-level declines. The SIR analysis and EPA (2017) both ignore the hydrologic changes that would mitigate and decrease impacts to stream flow, water availability, and vegetation. For example, when groundwater levels decline, due to seasonal and annual precipitation, and/or pumping, the water lost to evapotranspiration (ET) also decreases. The resulting groundwater decline is mitigated and offset by decreases in water lost to ET. This process occurs naturally on a seasonal and annual basis.

    As to specifics regarding Empire Gulch, Page 72 of the SIR discusses the uncertainty regarding predictions most clearly, "*At this time, we do not understand enough about Upper Empire Gulch Springs to develop an accurate conceptual model specific to the springs.*" This uncertainty about accuracy for model development can be seen in the range of time associated with the impacts; depending upon the assumptions made, the impact timing ranges from 20 years to 1,000 years post-mining. It can also be seen in the decision to ignore the nearby artesian conditions in the assessment of impact.

12. **Comment** (Page 5, Paragraph 2): *Wetlands within Lower Empire Gulch, including the Cieneguita Wetlands, will experience degradation of water quality, contraction of pool volume and surface area impacting aquatic vegetation and obligate plants. Lower Empire Gulch can expect a decrease in pool volume to 67 percent of the original volume from mine drawdown alone. (Reference: SIR, p. 139.)*

    Page 5, Paragraph 2: *When combined with climate change, pool volumes are projected to decrease to 42-57% of their original volume. (Reference: SIR, p. 139)*

    Page 5, Paragraph 2: *The SIR states that pools associated with the Cieneguita wetlands will be reduced anywhere from 25-92% of their original volume. (Reference: SIR, p. 139.)*

    Response: These EPA statements are highlighting a decrease in pool volume when the more important stream flow is not predicted to be impacted. The SIR states "*Lower Empire Gulch (reach EG2) and the Cieneguita Wetlands show similar results as those along Cienega Creek, but with greater expected impacts to water quality and pools.* Lower Empire Gulch does not see a large increase in days with zero stream flow from either mine drawdown or climate change… [emphasis added]."

    Regarding Cienega Creek, the SIR states "*Mine drawdown by itself has little to no effect on stream drying or pools, and minimal impact on water quality due to extremely low stream flow. Climate change by itself would mostly impact the lower reaches of Cienega Creek.*"

13. **Comment** (Page 5, Paragraph 2): *The SIR only analyzed the Cieneguita Wetlands, but Bureau of Land Management has identified more than 30 perennial or seasonal wetlands in the LCNCA, and various impacts to these wetlands are expected. (Reference: SIR, p. 67.)*

    Response: The EPA statement is misleading in the implication that "*more than 30*" additional areas would be impacted. The SIR states "*Other off-channel wetlands were considered for analysis, but similar to the selection of key reaches, these wetlands did not appear to carry the same importance as the Cieneguita wetlands, nor were any identified during the multi-agency collaboration to select key reaches. For instance,* during field visits between May and November 2014 the Cinco wetlands were visited but were largely dry. Nor were these wetlands a location for reintroduction of threatened or endangered species [emphasis added]. *Furthermore, Cieneguita wetland is closer to the mine than other identified wetlands and has a higher likelihood of being impacted (it sits within the floodplain of lower Empire Gulch)*"

14. **Comment** (Page 5, Paragraph 3): *The Groundwater drawdown and a decrease in stream flow permanence will cause impacts to riparian vegetation. (Reference: SIR pp. 131-132.)*

Response: Stream flow permanence is not a necessary condition for riparian vegetation, which rely on groundwater, not surface water. Furthermore, all groundwater drawdown does not impact riparian vegetation. Drawdown must be greater than the normal natural groundwater level variation and it must be greater than the individual plant tolerance for depth-to-water before any incremental impacts occur. The duration of declining groundwater levels also influences the severity of any vegetation impacts.

15. **Comment** (Page 5 footnote 37): *"Based field observation by EPA, a significant portion of these riparian communities are jurisdictional in the areas mapped as hydroriparian and mesoriparian community types. A jurisdictional delineation of all waters potentially impacted by the proposed project was not conducted."*

    Response: The jurisdictional status of "wetlands" located in the Cienega Creek watershed is speculative. To be considered jurisdictional wetlands, these areas must exhibit wetlands hydrology, soils, and vegetation (33 C.F.R. §328; (1987) Corps of Engineers Wetland Delineation Manual, pp. 9-10). Limited field observation is not an adequate basis to conclude that "*a significant portion*" of hydroriparian and mesoriparian areas would meet this definition. In addition, the status of wetlands as jurisdictional depends on their relationship to downstream traditional navigable waters, which EPA ignores. In any event, a jurisdictional determination of offsite wetlands has not been required, and is both outside the jurisdiction of the Corps (see discussion in **Section 4** regarding Section 404 jurisdiction over secondary effects) and unnecessary in the context of analyzing the effects of the discharge of dredged or fill material.

16. **Comment** (Page 5, Paragraph 3): *The high end of the model sensitivity analyses predicts that shift may occur as early as 20 years after mine closure. At this threshold, willows experience canopy dieback, reductions in overall plant density, and reductions in stem density and basal area of young cottonwood and willow. (Reference: SIR, p. 131.)*

    Response: Although EPA does not cite a specific location; it is clear from the SIR that this comment refers to Empire Gulch, Key Reach EG1. The SIR acknowledges the uncertainty and variability of impacts to vegetation due to changing groundwater levels. The SIR states: "*While research differs on exact thresholds, roughly speaking, once absolute depth to groundwater exceeds 7 feet, willow experiences canopy dieback greater than 10 percent, there is a reduction in the likely presence of younger cottonwood and willow specimens, and there is an overall reduction in stem density and basal area of cottonwood and willow. This threshold begins to be exceeded as early as 20 years, and by 150 years the majority of scenarios show depth to groundwater over 8 feet.*"

17. **Comment** (Page 6, Paragraph 2): …*the U.S. Fish and Wildlife Service (FWS) finds that increasing depths to groundwater will eventually result in changes in the species composition of a given site's riparian community (i.e., hydroriparian communities would suffer decreased vigor and extent, eventually transitioning to a xeroriparian community). (Reference: U.S. Fish and Wildlife Service Amended Final Biological and Conference Opinion for the Rosemont Copper Mine, Pima County, Arizona dated April 28, 2016 [BO], p. 62.)*

Response. EPA highlights speculative and unlikely outcomes. This statement and the remainder of the paragraph present *possible* outcomes if the depth-to-groundwater continually increases to some unspecified depth beyond which vegetation cannot access groundwater. This does not mean that such dramatic extremes would occur due to the Project.

It is also important to point out that the changes in these communities, to the extent that they occur at all, will occur around the margins, and are not predicted to result in the complete conversion of an entire community from hydroriparian to xeroriparian. The FEIS (p. 542) states "*While total conversion from a hydroriparian to a xeroriparian corridor is unlikely, there is likely to be contraction of the hydroriparian area, with conversion occurring at the transitional margins of the habitat.*"

Moreover, the likelihood that vegetation will experience these changes is mitigated in part by the adaptability of riparian communities in areas of high variability in groundwater levels, which is the case in this area. The BO acknowledges the adaptability of vegetation to changing groundwater levels (BO p. 62). "*It is also important to note that riparian vegetation tends to develop in response to local conditions; communities that exist in sites with highly variable alluvial groundwater levels tend to have rooting depths capable of withstanding relatively larger variations in groundwater level than sites where groundwater elevations are more consistent (Shafroth, Stromberg, and Patten 2000). The streams in the action area exhibit high variability.*" The groundwater levels also exhibit high variability. The predicted groundwater level changes would be well within the recently observed variability. The FEIS p. 295 states, "*While drawdown of less than 5 feet could cause impacts to springs and surface waters, natural variability in groundwater levels is already causing changes of this magnitude in the vicinity of sensitive surface waters in the analysis area.*" Even greater groundwater variability would be expected based on the climate variability that has existed over the past several hundred years.

18. **Comment** (Page 6, Paragraph 2): *The FWS states a reasonable assessment is to assume that negative trends in woody riparian habitat observed during the current drought are likely to continue due to climate change. (Reference: BO p. 65.) The FWS anticipates appreciable reductions in the representation of cottonwood/willow dominated communities along Cienega Creek and Empire Gulch. Mine drawdown will precipitate an earlier onset and exacerbation of these effects.*[42] *(Reference: BO p. 71.)*

    Response: EPA and FWS acknowledge that impacts to woody riparian habitat are likely to continue with no Project impacts. The predicted Project related drawdown is minor and would likely be offset by decreases in ET water use. It is equally likely that at the current rate of water-level decline and stream flow decreases due to climate conditions that impacts will be fully experienced prior to the potential mine impact propagating to these distant areas.

    It is important to remember that the modeled groundwater drawdown ranges from 0 to 6 feet, depending upon time, distance and scenario chosen, with most model results showing impacts between 0 and 0.15 feet (SIR, Appendix M) in Cienega Creek. The SIR also categorized possible impacts from climate change and those groundwater drawdowns were estimated to be between n/a (or 0) and 0.6 feet depending upon location. It is more likely that continuation of climate conditions over the past 30 years will result in impacts that exceed those predicted for the Project and that those impacts will occur much sooner than predicted.

19. **Comment** (Page 6, Paragraph 4): *Empire Gulch - Per the FEIS, an estimated 407 acres of hydroriparian habitat may be affected by changes in stormwater or changes in groundwater levels in Empire Gulch. (Reference: FEIS, p. 541.) Estimates were based on model predictions*

    Response: EPA is again overstating the potential impacts. The 407 acres is the total hydroriparian habitat present. The short-term drawdown is predicted to be 0.1 feet and long-term drawdown 2.3 feet. The FEIS states "*While total conversion from a hydroriparian to a xeroriparian corridor is unlikely, there is likely to be contraction of the hydroriparian area, with conversion occurring at the transitional margins of the habitat.*" The EPA is implying that the entire 407 acres may be affected when the FEIS is indicating that a much smaller area could potentially be affected.

20. **Comment** (Page 6, Paragraph 4): *Based on the high estimate of model predictions, groundwater drawdown would cause widespread mortality or transition from hydroriparian to xeroriparian, with cottonwood/willow experiencing the greatest stress. Wetland complexes within the hydroriparian zone would experience drying and widespread mortality of obligate wetland plants and aquatic vegetation. (Reference: FEIS, p. 542.)*

    Response: EPA exaggerates potential impacts and refers to the speculative high extreme of predicted potential long-term effects at Empire Gulch. The FEIS states that "*Long-term impacts are less certain or even speculative, not only because the uncertainty of the model results increases with time but because the cumulative effects from other future actions and climate change are difficult to predict during these long-time frames.*" (FEIS, p. 503)

    The FEIS also states "*In the near term, the higher estimate of groundwater drawdown (1.8 feet) would be unlikely to cause widespread mortality or transition from hydroriparian to xeroriparian habitat, but cottonwood/willow forest would experience stress due to deeper groundwater availability, including a decrease in canopy height and vegetation volume. While total conversion from a hydroriparian to a xeroriparian corridor is unlikely, there is likely to be contraction of the hydroriparian area, with conversion occurring at the transitional margins of the habitat.*" (FEIS, p. 542)

21. **Comment** (Page 6, Paragraph 5): *The FWS supports these conclusions stating Upper Empire Gulch is almost certain to experience major shifts in riparian vegetation due to mine drawdown, regardless of climate changes stresses. They note the 95th percentile analysis predicts the rapid onset of adverse effects (10 years post-mining) followed by a steady progression through drying conditions until total dewatering (zero flow) occurs at 150 years post-mining. The FWS anticipate these effects to result in losses of broadleaf woody riparian species and extirpation of aquatic and emergent vegetation.[46] (Reference: BO, p. 69)*

ED_002020B_00022393-00020

Response: This is an accurate representation of the BO; however, the speculative nature of these long-term impacts was stated in the FEIS (p. 503). The validity of the 95th percentile analysis was also shown to be erroneous in Hudbay (2015) and in fact the analysis is a 97.5th percentile. This analysis was biased toward extreme, unlikely to occur conditions to present an overly conservative analysis for impacts on threatened and endangered species rather than to be representative of the range of likely conditions.

22. **Comment** (Page 7, Paragraph 2): *Davidson Canyon - Mesoriparian habitat in Davidson Canyon (Reach 2) may experience reduced recruitment, increased mortality rates, and decreased canopy height. (Reference: FEIS, p. 543.)*

    Response: In full, the FEIS states "*This reach of Davidson Canyon is characterized as xeroriparian habitat with pockets of mesoriparian habitat; these pockets of mesoriparian habitat may be supported by shallow alluvial groundwater. …*" The EPA implies extensive mesoriparian habitat, but in reality, it is limited in extent.

    The Project impact on the vegetation water source in Davidson Canyon would be limited. The FEIS (p. 543) states "*…changes in surface flow can be estimated to occur along this reach and would range from 13.1 to 34.8 percent.*" A small percentage of surface flow recharges the shallow aquifer. A small decrease in shallow alluvial groundwater is possible, but any impact on mesoriparian habitat is speculative.

23. **Comment** (Page 7, Paragraph 2): *Impacts to recently documented hydroriparian habitat in Davidson Canyon, have not been assessed in the FEIS. (Reference: R.A. Leidy, EPA. Personal Observation April 20, 2016.)*

    Response: Riparian habitat in Davidson Canyon has been extensively and repeatedly mapped over several years. It is unlikely that the EPA discovered new habitat on a one-day field trip. The prevailing dry conditions would make establishment of new hydroriparian habitat highly unlikely. The EPA statement is unsubstantiated, and even if substantiated, the significance is questionable.

24. **Comment** (Page 7, Paragraph 2): *Forty-nine riparian areas associated with springs will be adversely impacted due to groundwater drawdown, according to the FEIS.*

    (Page 7, footnote 49): *The FEIS estimates impacts to 494 acres of Important Riparian Areas. These areas are designated by Pima County for their highest value and function; providing landscape linkages and high biological productivity. (Reference: FEIS, p. 501 and Table 108, p. 509.)*

    Response: EPA is overstating the potential impacts and the certainty of it occurring. The FEIS, Table 108, p. 509 states "*…14 riparian areas associated with springs would be directly or indirectly disturbed with high certainty; and an additional 35 riparian areas associated with springs may be indirectly disturbed but with less certainty.*"

The FEIS (p. 501) states "*A total of 494 acres of Important Riparian Areas is located within the Project area, including much of Barrel Canyon and its tributaries. An Important Riparian Area is a regulatory distinction but does not factor into the assessment of physical riparian impacts in the FEIS.*"

25. Comment (Page 7, Paragraph 3): *Cienega Creek - Within Cienega Creek (Reaches 1 through 5) and Gardner Canyon (Reaches 1and 2), high model estimates predict a contraction of the hydroriparian area, with conversion occurring at the transitional margins of the habitat. (Reference: FEIS, p. 542)*

Response: EPA is focusing on extreme, and unlikely to occur, impact estimates. Habitat contraction at the margins was predicted under the high extreme estimate of groundwater drawdown (up to 0.8 foot). "*The estimates of groundwater drawdown based on best-fit models (up to 0.5 foot) would not be likely to result in any changes to riparian vegetation, even up through 1,000 years after mine closure.*" (FEIS, p. 542-543)

It is unrealistic to predict any meaningful difference in impacts with a 0.3-foot difference in drawdown. It is also unrealistic to predict any meaningful impacts due to less than 1 foot of drawdown, which is within the natural annual variability and long-term trends.

4. GROUNDWATER DRAWDOWN AS A "SECONDARY EFFECT"

Groundwater drawdown associated with the mine pit is not a "secondary effect" of the discharge of dredged or fill material permitted pursuant to Section 404 of the Clean Water Act.

The EPA (2017) on page 9 asserts that: "*In addition to the direct impacts, the secondary impacts to waters based on the activities conducted on the* 'fast land' *created by the discharge must be evaluated. Construction of the mine pit requires a §404 CWA permit and the secondary effects of groundwater drawdown from the mine pit is a secondary impact regulated under §404 CWA.*" The EPA cites to the 404(b)(1) Guidelines (published at 40 C.F.R. Part 230)("Guidelines") as the basis for this position. Region 9's position both misstates the scope of the Guidelines and the jurisdiction of the Corps under Section 404 of the Clean Water Act.[3]

4.1. The Guidelines Focus on Evaluating the Effects of the Discharge of Dredged or Fill Material

Section 404 authorizes the Corps to regulate and issue federal permits (with EPA oversight) "*for the discharge of dredged or fill material into the navigable waters at specified disposal sites.*" (*Id.* § 1344(a)) Section 404(b) addresses how "*disposal sites*" are to be "*specified*":

[3] This issue was previously raised by EPA Office of Wetlands with the Corps in a document entitled "EPA Evaluation of Impacts to the Aquatic Ecosystem and Proposed CWA Compensatory Mitigation for the Rosemont Mine Pima County, Arizona" that was sent to Colonel Colloton of the Los Angeles District by letter dated November 7, 2013. Rosemont provided a response to Colonel Colloton by letter dated December 13, 2013, pointing out the erroneous position taken by the Office of Wetlands. That analysis is incorporated here.

> "*Subject to subsection (c) of this section, each such disposal site shall be specified for each such permit by the Secretary*...through the application of guidelines developed by the Administrator, [emphasis added] *in conjunction with the Secretary, which guidelines shall be based upon criteria comparable to the criteria applicable to the territorial seas, the contiguous zone, and the ocean under section 1343(c) of this title,* ..." (*Id.* § 1344(b)).[4]

The EPA adopted the Guidelines pursuant to this authority.[5]

Section 404(b) provides that the Guidelines "*shall be based upon criteria comparable to the criteria applicable to the territorial seas, the contiguous zone, and the ocean under section 1343(c).*" 33 U.S.C. § 1344(b). This CWA section prescribes statutory criteria for authorizing discharges of pollutants into the territorial seas and oceans under National Pollutant Discharge Elimination System permits, and requires EPA to adopt "*guidelines for determining the degradation of the waters of the territorial seas, the contiguous zone, and the oceans*" from such discharges. (*Id.* § 1343(c)) These guidelines must include an evaluation of the "*effect of the disposal of pollutants*" on various resources including human health or welfare, fish, wildlife, shorelines and beaches, marine life, and esthetic, recreational, and economic values. The ocean dumping guidelines also require an evaluation of "*the persistence and permanence of the effects of disposal of pollutants*" and "*the effect of the disposal of varying rates, of particular volumes and concentrations of pollutants.*" (*Id.*) Thus, while EPA is directed to consider factors beyond water quality impacts, the scope of review is nonetheless limited to the effect of *the disposal of pollutants* on each factor. Consistent with the Section 403(c) criteria, the Guidelines focus on the adverse effects of the discharge of dredged or fill material at the proposed disposal site, as discussed in **Section 4.2**. That is the "discharge of pollutants" being regulated under Section 404.

The Guidelines themselves require the Corps to evaluate a variety of impacts on the aquatic ecosystem into which dredged or fill material—pollutants—would be discharged (See 40 C.F.R. §§ 230.20-230.54). Section 230.11, entitled "*factual determinations,*" requires the Corps to "...*determine in writing the potential short-term or long-term effects* of a proposed discharge of dredged or fill material [emphasis added] *on the physical, chemical, and biological components of the aquatic environment in light of subparts C through F*..." The required factual determinations include physical substrate determinations; water circulation, fluctuation, and salinity determinations; suspended particulate/turbidity determinations; contaminant determinations; aquatic ecosystem and organism determinations; and proposed disposal site determinations (*Id.* § 230.11(a)-(f)). In each case, the factual determination is expressly related to *the effect of the proposed discharge, e.g., Id.* §§ 230.11(a) ("*Physical substrate determinations.* Determine the nature and degree of effect that the proposed discharge will have, individually and cumulatively, on the

[4] As used in Section 404, the term "Secretary" refers to the Secretary of the Army, acting through the Corps' Chief of Engineers. 33 U.S.C. § 1344(d). CWA 33 U.S.C. § 1343(c) deals with ocean dumping, and is discussed in more detail below as this statute provides useful guidance on the scope of the 404(b)(1) Guidelines.

[5] The Guidelines also cite the EPA Administrator's general authority to "prescribe such regulations as are necessary to carry out his functions under" the CWA, id. § 1361(a). 40 C.F.R. Part 230.

characteristics of the substrate at the proposed disposal site."); 230.11(e) ("*Aquatic ecosystem and organism determinations*. Determine the nature and degree of effect that the proposed discharge will have, both individually and cumulatively, on the structure and function of the aquatic ecosystem and organisms.").

4.2. Evaluation of Secondary Effects Does Not Extend to Groundwater Drawdown Associated with the Mine Pit

Part of this factual determination includes an evaluation of "secondary effects", and the Guidelines and guidance supporting the Guidelines make clear that such effects are closely tied to the discharged material, *i.e.,* the fill that must be permitted to create facilities where waters once existed. "Secondary effects" are defined by the Guidelines as the "*effects on an aquatic ecosystem that are associated with a discharge of dredged or fill materials, but do not result from the actual placement of the dredged or fill material.*" (40 CFR § 230.11(h)(1)). The Guidelines provide three specific examples to define such effects. The first example is "*fluctuating water levels in an impoundment and downstream associated with the operation of a dam.*" The second example is "*septic tank leaching and surface runoff from residential or commercial developments on fill.*" The third example is "*leachate and runoff from a sanitary landfill located in waters of the United States.*" Each of these examples are water quality impacts associated with the fill material left in place after it has been discharged.

In the first example, fill material is discharged to create a dam, which impounds water, and the dam then affects the water levels both in the impoundment and downstream. The focus is on the effects of the fill after discharge. In the second example, fill material is discharged to create dry land (fast land) on which a residential or commercial development is built, and the development on that fast land then generates leachate from septic systems or surface runoff from the fill. Again, it is the secondary effects of fill or activities taking place on that fill after discharge that must be assessed. Similarly, in the third example, the discharge of fill creates a sanitary landfill located in waters of the United States and the storm water that falls on the landfill then produces surface runoff and leachate into the groundwater as it passes over and through the landfill.

There would be no misunderstanding about the meaning of the examples, as they are followed by an explicit statement that "*activities to be conducted on fast land created by the discharge of dredged or fill material in waters of the United States may have secondary impacts within those waters which should be considered in evaluating the impact of creating those fast lands.*" (*Id.*) This statement is specific to activities conducted on a structure or feature created by the discharge of fill material.

Rather than evaluating the effects of the discharge, EPA erroneously leaps to the conclusion that all "secondary effects" of the Project, as a whole, represent secondary effects that must be evaluated under the Guidelines. However, the pit of course is not fill—it is the opposite of fill—an excavated depression. Groundwater flowing into the pit is not therefore an impact associated with the discharge of fill; rather, it is an impact of the larger mining operations that are regulated by other programs, such as the Aquifer Protection Program, or the USFS's Mine Plan of Operations, but not Section 404.

4.3. Guidance from EPA Office of Counsel Supports the Conclusion That Groundwater Drawdown is Not a Secondary Effect of the Discharge

This conclusion is reinforced by the guidance on secondary effects issued by EPA's General Counsel and cited by EPA; see Memorandum from Robert M. Perry, Assoc. Admin. And General Counsel, to Fredric Eidsness, Jr., Assistant Administrator for Water regarding Legal Issues Concerning Section 404(b)(1) Guidelines (March 17, 1983), *published in* U.S. Environmental Protection Agency, General Counsel Opinions from the Office of General Counsel, January 1980 Through June 1985 (EPA Office of General Counsel, April 1987) ("Guidance"). The Guidance was issued in response to a question posed by EPA's Assistant Administrator for Water: "Must the guidelines consider secondary impacts?" In response, the General Counsel stated:

> "*By 'secondary impacts,' I am assuming that you mean reasonably foreseeable impacts of the discharge itself that occur away from the immediate site of the discharge, e.g., downstream impacts or impacts from the altered circulation as opposed to impacts on whatever is buried by the discharged material. Such secondary impacts must be considered in the guidelines. Some impacts that may be caused by the subsequent operation of a project or by associated development may be considered, depending on the directness of the causal connection, the predictability of such impacts and a general rule of reason.*" (Guidance, p. 128)

The EPA relies on this language to make the leap from the discharge of fill to groundwater drawdown caused by the mine pit, an activity wholly unregulated by Section 404. The 404(b)(1) Guidance makes this clear:

> "*When one moves beyond secondary impacts, as defined above, to impacts caused by the subsequent operation of a project or by associated development, the question becomes more difficult. While it is hard to answer in the abstract, in general whether such impacts must be considered would appear to depend on the directness of the causal connection and the predictability of the impacts, interpreted in the light of reason. For example, where fill is discharged to build a dam whose purpose is to manipulate water flow, the permitting authority, in evaluating the impacts of the fill, may reasonably take into account the fact that water levels will be manipulated. On the other hand, when a barge--loading facility for an upland factory involves some fill, the water quality impacts of the factory are outside the scope of the guidelines, even if they are, in a sense, a 'result' of the fill.*" (*Id.* p. 129)

Like the Guidelines, the Guidance allows for the possibility that some downstream effects of the structure or feature created by a discharge are properly considered "secondary effects" of the discharge. In the Guidance, as in the Guidelines, the example of a dam is used. Because the dam is created by the discharge, and has as its purpose the storage and release of water, the General Counsel

ED_002020B_00022393-00025

concludes that "*the permitting authority may reasonably take into account the fact that water levels will be manipulated*" as a result of the fill, and that the effects of the manipulation may, therefore, be considered a "secondary effect" of the discharge. On the other hand, the General Counsel uses the example of a discharge that is necessary to construct "*a barge-loading facility for an upland factory*" to illustrate effects that would not properly be considered "secondary effects" of the discharge. It is apparent that the General Counsel concludes that because the upland factory would not be created by the discharge itself, "*the water quality impacts of the factory are outside the scope of the Guidelines, even if they are, in a sense, a 'result' of the fill*"—*i.e.*, even if the factory might not be built if the 404 permit is not issued.

This latter example is directly analogous to the situation presented by Rosemont's proposed discharge. To facilitate the operation of the Project, which equates to the "upland factory" in the General Counsel's example, Rosemont needs to construct tailings, waste rock, and ancillary facilities; similar to the "*barge-loading facility*" in the General Counsel's example, and the construction of those facilities will require "some fill." While the water quality impacts of the Project as a whole could possibly be considered, "*in a sense, a 'result' of the fill,*" in that they might not take place if the 404 permit is not issued, "*they are [nonetheless] outside the scope of the guidelines*" because the impacts are not effects of the discharge itself; they are the effects of some other activity, in Rosemont's case the operation of the open pit, which is not regulated under section 404.

Based on the examples given in the Guidelines and in the Guidance, it is clear that for an effect on aquatic resources to be considered a "secondary effect" of the "discharge itself," the effect must be the result of water interacting with the structure or feature created by the discharge of fill—*i.e.*, it must be the result of water running across or through, or being manipulated by, the structure or feature that is created by the discharge of fill. This is what is meant by the Guidelines' definition of "secondary effects" as "*effects that are associated with a discharge of dredged or fill materials, but [that] do not result from the actual placement of the dredged or fill material.*" While citing to the Guidance, EPA (2017) has simply chosen to ignore the obvious conclusion to be drawn from it—the secondary effects evaluation should be focused on the discharge, not impacts from mine operations outside of CWA jurisdiction.

4.4. The Examples of Section 404 Permit Decisions Regulating the Secondary Effects of Groundwater Drawdown Do Not Change this Conclusion.

The EPA (2017) on pages 11-12 concludes its discussion of secondary effects by providing a list of projects apparently permitted by the Corps that included consideration of "*hydrological modification–induced secondary impacts to waters within the scope of the Corps §404 Analysis*". The apparent purpose of this is to demonstrate that there is precedent for the Corps evaluating groundwater drawdown. Because the Corps' analysis of secondary effects caused by a discharge can extend to hydrologic modifications (*e.g.,* through construction of a dam), the fact that the Corps has previously evaluated this type of impact is not surprising. If there is a sufficiently close causal connection between the discharge of fill and the hydrologic modification, the evaluation under the Guidelines would clearly encompass an evaluation of these effects.

The determination of secondary effects is of course a project-specific analysis dependent on the facts of a specific case. Only one of the projects (Dos Pobres/San Juan Mine) listed by EPA is in any way analogous to construction of a hard rock mine in an arid environment and the fact set in that case is significantly different than that for the Rosemont Project. In any event, the consideration of, or even regulation of, groundwater drawdown in a particular context may be the result of any number of factors outside the scope of the Guidelines. For these reasons, the fact that the Corps may be evaluating or regulating groundwater drawdown in a given context is not determinative of whether the Corps has that authority in the context of the Rosemont Project.

5. CONCLUSION

In their comments, the EPA (2017) relies on the dual incorrect assertions that: 1) groundwater drawdown is a regulated secondary impact that must be considered by the Corps, and 2) the evaluation of impacts performed for the FEIS prove that there will be significant environmental impacts associated with this drawdown. As demonstrated in this report, the potential effects resulting from groundwater drawdown are not subject to the Corps' regulatory authority, and are distant in time and well within the range of natural variation, if they occur at all. The assertions made by the EPA are simply not supported by the extensive analysis that has been completed in support of the permitting efforts for the Project, and the EPA provides no independent analysis of their own.

6. REFERENCES

Alley, W.M. 2007. "Another Water-Budget myth—The Significance of Recoverable Ground Water in Storage. Guest Editorial." *Ground Water* 45 (3): 251.

Earman, Sam, and Michael Dettinger. 2011. "Potential Impacts of Climate Change on Groundwater Resources – a Global Review." *Journal of Water and Climate Change* 2 (4): 213–29. doi:10.2166/wcc.2011.034| 02.4.

Environmental Laboratory. 1987. "Corps of Engineers Wetlands Delineation Manual." *Technical Report Y-87-1*. Vicksburg, Misssissippi: U.S. Army Engineer Waterways Experiment Station. http://www.lrh.usace.army.mil/Portals/38/docs/USACE 87 Wetland Delineation Manual.pdf.

Hudbay. 2015. "Review of Draft Reinstated Biological Opinion – Specific Comments." *Letter to Coronado Forest U.S. Forest Service*. Tucson, Arizona: Hudbay, December 21, 2015.

Knox, Ken. 2006. "The Republican River." *Presentation by Chief Deputy State Engineer*. SEO Forum, September 6, 2006.

Levick, Lainie R., David C. Goodrich, Mariano Hernandez, Julia Fonseca, Darius J. Semmens, Juliet Stromberg, Melanie Tluczek, et al. 2008. "The Ecological and Hydrological Significance of Ephemeral and Intermittent Streams in the Arid and Semi-Arid American Southwest." *EPA/600/R-08/134, ARS/233046*. U.S. Environmental Protection Agency and USDA/ARS Southwest Watershed Research Center, 116.

Montgomery & Associates. 2010. "Groundwater Flow Modeling Conducted for Simulation of Proposed Rosemont Pit Dewatering and Post-Closure REVISED REPORT." *Prepared for Rosemont Copper*. Tucson, Arizona: Montgomery & Associates, Inc.

Shafroth, Patrick B., Juliet C. Stromberg, and Duncan T. Patten. 2000. "Woody Riparian Vegetation Response to Different Alluvial Water Table Regimes." *Western North American Naturalist* 60 (1). https://scholarsarchive.byu.edu/wnan/vol60/iss1/6.

SWCA Environmental Consultants Inc. 2014. "Draft Memorandum: Refined Approach to Streamflow Predictions." Tucson, Arizona: SWCA Environmental Consultants, July 22, 2014.

Tetra Tech. 2010. "Regional Groundwater Flow Model Rosemont Copper Project." *Prepared for Rosemont Copper*. Tucson, Arizona: Tetra Tech.

U.S. Environmental Protection Agency. 2017. "EPA Analysis of the Significant and Irreversible Environmental Consequences of Groundwater Drawdown from the Proposed Rosemont Mine." *Memorandum Dated October 5, 2017, Revised November 30, 2017*.

U.S. Fish and Wildlife Service. 2016. "Amended Final Reinitiated Biological and Conference Opinion for the Rosemont Copper Mine, Pima County, Arizona." *AESO/SE 22410-2009-F-0389R1*. Phoenix, Arizona.

U.S. Forest Service. 2015. "Supplemental Information Report Rosemont Copper Project." *Southwest Region*. U.S. Department of Agriculture. https://www.rosemonteis.us/files/supplemental-information-report/049043.pdf.

U.S. Forest Service. Coronado National Forest. 2013. "Final Environmental Impact Statement for the Rosemont Copper Project: A Proposed Mining Operation Coronado National Forest Pima County, Arizona." *Southwest Region*. Tucson, Arizona: U.S. Department of Agriculture.